(19) World Intellectual Property Organization

International Bureau





(43) International Publication Date 19 May 2005 (19.05.2005)

PCT

(10) International Publication Number WO 2005/045239 A1

(51) International Patent Classification⁷:

F02N 11/08

(21) International Application Number:

PCT/JP2004/015772

- (22) International Filing Date: 19 October 2004 (19.10.2004)
- (25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2003-381474

11 November 2003 (11.11.2003)

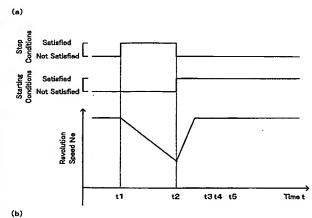
- (71) Applicant (for all designated States except US): TOY-OTA JIDOSHA KABUSHIKI KAISHA [JP/JP]; 1, Toyota-cho, Toyota-shi, Aichi 4718571 (JP).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): TAKI, Nobuyuki

[JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyota-cho, Toyota-shi, Aichi 471-8571 (JP). KATO, Minoru [JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyota-cho, Toyota-shi, Aichi 471-8571 (JP).

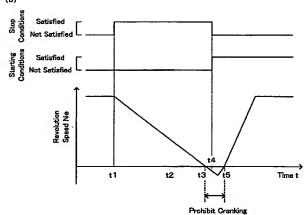
- (74) Agent: ITEC INTERNATIONAL PATENT FIRM; Pola-Nagoya Bldg., 9-26, Sakae 2-chome, Naka-ku, Nagoya-shi, Aichi 460-0008 (JP).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

[Continued on next page]

(54) Title: STARTING APPARATUS FOR INTERNAL COMBUSTION ENGINE AND AUTOMOBILE



(57) Abstract: An idling stop control of the invention attains an auto start and an auto stop of an engine. At a time point t1, preset stop conditions are met to cut off a fuel supply to the engine. Preset starting conditions may be met at a time point t2 when the engine still continues rotating in a normal direction by the inertial force. In this state, the idling stop control starts cranking the engine. The preset starting conditions may be met at a time point t4 when a piston does not complete a compression cycle immediately before a stop of the engine but is pressed back by the compressed air to rotate the engine in a reverse direction. In this state, the idling stop control waits until cancellation of the reverse rotation of the engine and then starts cranking the engine. The arrangement of the invention desirably ensures a quick start of the engine, while effectively preventing an excess stress from acting on a gear mechanism, which connects a starter motor to the engine.



WO 2005/045239 A1



GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.